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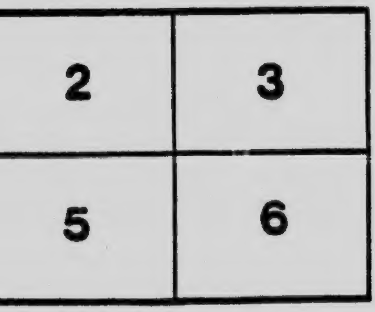

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EXTRACTS FROM REPORTS

UPON

PURE WATER SUPPLY

FOR THE

CITY OF OTTAWA.

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1911

OTTAWA PRINTING CO., LTD.

REPORT OF PURE WATER COMMISSION.

To the Mayor and Members of the Council
of the Corporation of the City of Ottawa,

Gentlemen:—

The following members of the Commission being a majority thereof, viz.:—Allen Hazen, Chas. A. Hodgetts and J. W. S. McCullough are agreed as follows:—

We find the Water of the Ottawa River, which is the present source of supply, to be polluted and unfit for a public supply either at the present intake or at any other point where the intake could reasonably be placed. We are of the opinion that the pollution will increase and not diminish.

The Hypochlorite treatment now in use greatly improves the supply by destroying the bacteria. It does not remove the color or other organic impurities. In other words it disinfects but does not clean up the water as must be done in order to make it acceptable as a public water supply. For these reasons its use must be considered a temporary measure and not a permanent solution of the water problem.

No system of sand filtration, either simple or multiple, without chemical treatment, is capable of removing the colour and the excessive amount of organic matter in the Ottawa River water.

Such processes of filtration are successfully applied to many river waters such as the Thames at London, the Elbe at Hamburg, the Hudson at Albany, and the Delaware at Philadelphia. None of these waters are as highly coloured as the Ottawa River water or carry as large amounts of dissolved organic matter. It should be clearly understood that these processes, although well adapted to conditions in other localities, are not, in our judgment, applicable to the Ottawa River water.

The colour and excessive dissolved organic matter in the Ottawa River water may be removed by suitable chemical treatment followed by filtration. The water so obtained will be in general of good quality. This process is widely and successfully used in various American cities.

Water so treated will dissolve iron from the pipes and the iron will afterwards separa[illegible] rise to complaints. This is known as the red water trouble. It is a serious and objectionable condition, difficult to overcome, when soft waters charged with dissolved organic matter are cleaned by chemical treatment.

The Gatineau River water is of the same general character as the Ottawa River water and offers no advantages over the latter to warrant the removal of the pumping plant to the opposite side of the river, which would necessitate carrying the delivery pipes under the Ottawa River.

The catchment basin of the Blanche River, located in the Province of Quebec, is capable of furnishing an abundant supply of the purest water. The water would be taken from a reservoir formed by a dam at the outlet of McGregor Lake, within fifteen miles of the City Hall.

The low water flow at the outlet of McGregor Lake is not sufficient to supply the present needs of the City, but there are large quantities of water flowing away during the spring floods, and there are excellent opportunities to hold back these flood flows and make them available in other and drier portions of the year.

On present information, over fifteen million gallons of water per day can be obtained from this source with full storage of flood flows. This is capable of supplying one hundred gallons of water daily per capita to half a million people.

In addition to the catchment basin of the Blanche River, there are other large systems of lakes to the north. These are higher in elevation. In the future when Ottawa becomes a large city, requiring more than fifty million gallons of water daily, the water from these lakes can be brought into the system by suitable tunnels and aqueducts.

The general method of supply that we recommend, consisting essentially of the storage of flood water from upland areas, is one widely used by cities having suitable areas in their neighborhood. Among such cities may be mentioned, Birmingham, Manchester, Edinburgh, Glasgow, Melbourne, Sydney, New York, Boston, Rochester. Syracuse, Denver, San

Francisco, Vancouver, St. John, N.B., Quebec and Fort William.

It is seldom that conditions have been found so favorable for this system as those of the Blanche River catchment area. The waters of the beautiful lakes in this district can easily be raised by inexpensive dams in narrow rocky outlets, thereby obtaining ideal storage at a low cost. The whole supply for a year can thus be stored and if it were desired, two years' supply could easily be held.

The catchment area is rough and rocky, with a scattered rural population which is not likely to increase. Summer visitors are to be anticipated. These can be controlled, as is done in similar cases, so as not to impair the quality of the water.

The Blanche River supply, drawn through McGregor Lake, is high enough to serve the city by gravitation without pumping and will maintain a higher pressure than is now carried.

We believe that the advantages of the proposed gravity system are so great that we should prefer it, even if the cost were substantially greater than that of filtered Ottawa River water. A greater cost, however, is not indicated by the estimates we have considered.

Upon present information, the cost of the Blanche River water will not exceed the cost of properly filtered Ottawa River water when both operating costs and the costs of construction are given due weight.

There will be no red water trouble with the Blanche River water.

The Blanche River water will not require filtration. It will be of better quality than the Ottawa River water, even after the latter is properly filtered.

Ottawa is the capital city of the Dominion of Canada and should have the best water supply that can be obtained.

Should it be decided in future to make a Federal District of the cities of Ottawa and Hull with their environs, residents of such Federal District would be assured, if this plan were adopted, of a pure water supply, ample in quantity and collected and stored under the best and most improved conditions.

In conclusion, we recommend the catchment basin of the Blanche River as the best source of water supply for the City of Ottawa.

Mr. C. H. Keefer, a member of the Commission dissents from the above and is of the opinion that—

"The most important question where the future supply is to be obtained depends on changes that may take place in future conditions and will be largely influenced, in my opinion, by the prospect of Ottawa becoming a Federal District, and by the construction of the Georgian Bay Canal which means that Lake Deschenes will be extended by the construction of a dam at the Little Chaudiere to within the City limits, creating at the same time an additional and new water power with a working head of 20 feet, and making Lake Deschenes at Ottawa a splendid reservoir for the supply of water as well as power.

"Mr. Hazen in his report, Part III, 'conclusions and recommendations,' has already stated that the 'Ottawa River supply now in use is in many respects a magnificent supply.'

"The foregoing statements are made to emphasize the well known fact that the Ottawa River, the largest tributary of the St. Lawrence, is naturally a magnificent source of supply, and more particularly to emphasize my opinion that it cannot be abandoned in favor of any gravitation supply, without the fullest possible consideration and for the strongest possible reasons.

"We have to choose between an, at first sight, attractive gravitation supply with a comparatively small catchment area, (including areas which would have to be diverted from the catchment area of the Gatineau and Lievre Rivers) and the inexhaustible supply furnished by the Ottawa River.

"Assuming the adoption of a gravitation supply, there are two things to do, to adopt the McGregor Lakes' supply with the possible risk of a breakage or failure in the miles of conduit between the Lakes and the City, as a sole source of supply, or to use both the McGregor Lake and the present Ottawa supply, the lake supply being used for all purposes, and the Ottawa supply maintained and used as at present protected by Hypochlorite, in case of failure of the lake supply, or as an additional fire service protection. This arrangement at present to me seems prohibitive.

"For the above and following reasons, I am of the opinion that the Ottawa River, under present conditions and for many years to come, is the natural and best source of supply.

"The quality of water in both the Ottawa River and the McGregor Lake is originally the same, the lake water having the advantage of being bleached by sunlight and held longer by storage in the deeper lakes.

"The color of the Ottawa River water can be removed, as pointed out by Mr. Hazen, by mechanical filtration. Slow sand filtration while more expensive in first cost of construction has the advantage with many waters of accomplishing the same results, without chemicals, and at less than half the cost for operation.

"The Ottawa water, technically designated colored, will probably not have much of its color removed by slow sand filtration, though it may probably lose 20 per cent., that is become 20 per cent clearer.

"As far as reduction of bacteria is concerned the results will probably be the same.

"In England, where the longest practical experience has been obtained of filtration under most difficult conditions compared with Canada, slow sand filtration is the standard method. The same remarks apply to European filtration works.

"If the Ottawa section of the Georgian Bay Canal should be commenced in the near future, and the dam at the Little Chaudiere constructed, the location of filter beds would be at a point below the dam, and for mechanical filters might be, as suggested by Mr. Hazen, on Lemieux Island, or more than sufficient provision for present requirements for slow sand filtration also be obtained at that point.

"If the Canal were not to be constructed for many years there is ample room for either slow sand or mechanical filters on the south shore of the river.

"To protect the river, without filtration, existing Health Laws should be enforced, co-operation of the Municipalities and Boards of Health secured on both the Ontario and Quebec sides of the River, between Britannia on one side and Aylmer on the other, to stop pollution and enforce sanitary measures for their own as well as Ottawa's protection.

"This might be accomplished effectually by the construction of separate sewers, for sewage only, extending from these points to a safe outfall in the river below the Ottawa Water Works pure water pipe.

"The McGregor Lakes would also have to be protected against pollution, or the cost of filtration works be added to the estimate already made.

"I am informed that the pure water pipe now being constructed in connection with the new Aqueduct of the Ottawa River Works is expected to be in operation within three months' time. This should make a radical change in the situation and prevent chances of pollution between the point of intake which is above the Canadian Pacific Railway Bridge, and the pumping station of the Ottawa Water Works. As I am convinced that the true, and under the circumstances, unavoidable source of pollution lies in the old pipe between these points, this has been foreseen and is to be very soon removed by the operation of the pure water pipe in connection with the new Aqueduct under construction.

"With regard to McGregor Lake supply, I am of the opinion even with the information we have, more time and definite information is required before it can be safely adopted as the sole source of supply and the inexhaustible supply, both for domestic and fire purposes, we have in the Ottawa River, abandoned.

"Too little is known of the capabilities of the lake supply with its comparatively small drainage or catchment area, which I consider is not sufficient as a sole source of supply.

"The calculations for supply are based on an assumed precipitation or fall of rain and snow. Definite information is being obtained by rain gauges established at Perkins Mills and Lucerne, but as the only records we have are for Perkins Mills from May to October, and for Lucerne from June to October, no use for value of yearly precipitation can yet be made of them.

"The run off of the Blanche River, as far as we know, is not sufficient to furnish a supply even at present daily rates of consumption.

"If McGregor Lakes are likely to become a source of supply it is very advisable to have monthly measurements at least made and gauges established to determine maximum, minimum and mean run off, or discharge of this river, which is the outlet of the lakes and "Basin" holding the water to be relied on for storage and supply. This information would be of the greatest possible value in determining the capacity for supply of the McGregor Lake area, as being if extended over a sufficiently long period, a more definite measurement of capacity of the catchment area than precipitation records and even if only obtained for a year or more of great assistance."

With the foregoing opinion of Mr. Keefer, the remaining members of the Commission are unable to agree.

Your Commission regrets that it cannot make a unanimous report upon the water supply.

Respectfully submitted,

(Signed) ALLEN HAZEN.
" CHAS. A. HODGETTS.
" CHARLES A. KEEFER.
" JOHN W. S. MCCULLOUGH.

Nov. 25th, 1911.

EXTRACT FROM REPORT

OF

ALLEN HAZEN, Esq., C.E.,

ON THE

IMPROVEMENT OF THE OTTAWA WATER SUPPLY

October 5th, 1910.

CONCLUSIONS AND RECOMMENDATIONS.

The **Ottawa River** supply now in use is in many respects a magnificent supply. The catchment area is large, the flow of the river is well balanced by natural storage in innumerable lakes, there is surprisingly little sewage pollution in the water for so large a river, the water is soft, it is close to the centre of the city, and it is cheaply delivered under pressure by water power.

The water as now delivered is objectionable:

(1) Because of the slight sewage pollution, and

(2) Because of its color.

The sewage pollution is small in comparison with that of other rivers, but it is already sufficient so that the water cannot be used in its raw state with confidence, and is steadily increasing.

The best way to purify the present supply is to build filters upon Lemieux Island.

The estimated cost of building such filters with a nominal capacity of 25 million Imperial gallons per day, suitable for use with an average daily use of 16 to 18 million gallons, with their necessary appurtenances, connected with the present works, is	$659,000
The cost of operation is estimated at $6.26 per million gallons. For 18 million gallons per day this amounts in a year to	41,000

McGregor Lake is the largest and lowest of the lakes in a chain with its outlet about 15 miles, as the water would flow, from the City Hall in Ottawa. The catchment area is 94 square miles, of which 11 miles are water surface. There are several excellent sites for storage reservoirs to hold the water of the spring floods and make it available during the drier portions of the year. The amount of water that can be made available with an average rainfall of 34 inches and run-off of 17 inches and with 85% of the water utilized, is 54 million gallons per day. This is sufficient to supply Ottawa when it has grown to be at least several times as large as it now is.

This quantity of water may be made available on the instalment plan as it is needed.

The catchment area is rough, mountainous, and has but little population. No sewage flows to the water, and complete sanitary protection may be secured.

The water is practically colorless, is very soft, and is in every way desirable for a public water supply.

McGregor Lake is sufficiently high so that the city may be supplied with full pressure by gravity. In other words, it will not be necessary to pump the water.

To bring the water to Ottawa about 12½ miles of 54 and 60 inch steel pipe will be required. It will also be necessary to take the water under the Ottawa and Rideau rivers. Under the rivers the pipe line will be divided so that in case of an accident to either line the service may be maintained through the other.

The cost of constructing works capable of bringing the water at the rate of 30 million gallons per day, suitable for maintaining the service with an average use of 20 million gallons per day, including all the works to the Rideau River, is estimated at	$1,787,000
To this add for lands, rights of way, water rights, contingent damages of every description, and for legal and administrative expenses	263,000
Total estimated cost of 1st instalment	$2,050,000

To carry the water to all parts of the city from the Rideau River would require additional lines of main piping costing something like	250,000
The annual cost of operation of the works is estimated at $5,000 and this capitalized at 5% is ...	100,000
Total comparative cost of gravity works	$2,400,000

When the cost of the McGregor Lake supply is compared with the sums that have actually been spent by American and European cities for securing corresponding sources of supply, this source seems an extremely cheap one. It is only by comparing it with the Ottawa River water pumped by water without cost and without even allowing for the value of the present pumping station that it seems expensive. Under any other conditions the opportunity of securing so large a supply of excellent water at a sufficient elevation, within a distance of 15 miles of the centre of the city, would be a most remarkable opportunity not to be allowed to pass.

The McGregor Lake water is better water and is worth getting if it can be secured even if it does cost somewhat more.

McGregor Lake lies in the Province of Quebec, and special authority will be required to allow its utilisation by Ottawa.

Recommendations.

If authority and rights can be secured, I recommend the construction of works for developing McGregor Lake.

If such authority and rights cannot be secured, then the purification of the Ottawa River water is worth while, and is recommended.

Carrying out the works in either case will occupy a considerable period of time, and during that period a substantial improvement in the quality of the Ottawa River supply may be secured by treating it with hypochlorite of lime. This is not recommended as a permanent treatment, but it is recommended as a temporary measure for use until permanent works may be secured.